Study On Life Style And Dietary Patterns Of Type -2 Diabetes Patients In Mumbai City

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Abstract:

INTRODUCTION: Type-2 Diabetes mellitus often referred as diabetes due to a combination of hereditary and environmental causes resulting in abnormally high blood sugar levels (hyperglycemia). Basically diabetes is a syndrome of disordered metabolism. Effective lifestyle modifications and healthy dietary pattern like the Mediterranean diet, together with physical activity are the core stone in the prevention of type-2 diabetes.

OBJECTIVE: To study the lifestyle and dietary patterns of type-2 diabetes patients in Mumbai city

METHODS: A cross sectional study was conducted in 100 (74 male and 26 female) type-2 diabetes patients visiting diabetes health camps. Subjects were divided in to two groups according to the duration of diabetes. First group were who had diabetes for ≤5 years and second group were who had diabetes for ≥6 years. Anthropometry, biochemical parameters, clinical symptoms, medical history, personal habits, physical activity, psychological health, eating and sleeping patterns was measured with 3-days diet recall. Results were statistically analyzed by standard methods.

RESULTS: Mean height of the subject was 160.1± 6.1 cm and weight was 64.4± 12.9 Kg. When compared between gender, males were significantly taller as compared to females ($P<0.05$). Males who had diabetes for ≥ 6 years had significantly higher weight as compared to females who had diabetes for ≥ 6 years ($P<0.05$). Prevalence of cataract, consumption of milk and intake of carbohydrate and fibre was significantly higher in the subjects who had diabetes for ≥ 6 years as compared to those who had diabetes for ≤ 5 Years ($P<0.05$). Numbers of sleeping hours, days exercised, duration of exercise, level of daily physical activity, consumption frequency of food items:- wheat flour, milk, apple, pear, oranges, pizza cake, pastry, Frankie, chines, sugar and intake of sucrose was significantly higher in the subjects who had diabetes for ≤5 years as compared to those who had diabetes for ≥ 6 years ($p<0.05$). BMI, hip circumference and waist circumference were significantly positively correlated with total cholesterol and triglycerides ($p<0.05$). Blood urea and serum creatinine were significantly positively correlated with systolic and diastolic BP ($p<0.05$). The mean energy intake was 1193±236 kcal/day, protein intake 36.8±9.2 g/d, carbohydrates 154.2±38.1 g/d, fat 44.5±9.1 g/d, fibre 24.9±8.2 g/d, total starch 118.2±32.8 g/d, fructose 5.7±4.4 g/d, glucose 2.8±2.2 g/d, sucrose 3.2±2.7 g/d and free sugar 16.5±8.2 g/d.

CONCLUSION: Physical exercise and awareness of Dietary changes helped to manage blood sugar levels of Type 2 diabetes patients.

Key-Words: Disordered metabolism, Effective lifestyle, Dietary patterns, Physical activity

Introduction

Type-2 diabetes mellitus (DM) is a chronic metabolic disorder in which prevalence has been increasing steadily all over the world. [1] Globally the number of people with diabetes mellitus has quadrupled in the past three decades and diabetes mellitus is the ninth major cause of death. An unhealthy diet and a sedentary lifestyle are important drivers of the current global epidemic. [2]

Adherence to a healthy dietary pattern, like the Mediterranean diet, exerts a beneficial role regarding the development of diabetes. Additionally certain individual food groups and components of the diet, such as monounsaturated fatty acids, fruits, vegetables, whole grain cereals, dietary fiber, fish and moderate consumption of alcohol, also may protect against the development of diabetes, possibly through the amelioration of insulin sensitivity and their anti-inflammatory actions. [3] Dietary patterns, which reflect the complexity of food preference, lifestyle and socio-economic status, has played a major role in health and longevity in type-2 diabetes patients. [4] Dietary pattern and health plays a major role in determining the food choice. High intake of the food group's like red meat, low-fiber bread, cereal, dried beans, fried potatoes, eggs, cheese, cottage cheese and low intake of wine characterized the pattern, which was positively associated with type-2 diabetes and related biomarkers. [5]

Lifestyle modification combining weight loss and physical activity reduced the short term and long term incidence of type-2 diabetes in high risk population. The incidence of type-2 diabetes was significantly inversely associated with exercise, vigorous physical activity, and typical walking pace and conversely positively associated with sedentary behaviors. [6] Type-2 diabetes results when the body does not make enough insulin or the body cannot use the insulin produced in it. When improperly managed

it can lead to a number of health issues including heart diseases, stroke, kidney disease, blindness, nerve damage, leg and foot amputations and death. [7]
Dietary fiber shows promise in the management of type 2 DM. The inclusion of sufficient dietary fiber in a meal flattens the postprandial glycemic and insulinemic excursions and favorably influences plasma lipid levels in patients with type 2 DM. [8] Study suggested that high-fibre diets and soluble fibre supplements may offer some important in carbohydrate metabolism. An intake of up to 40 g of fiber per day or 25 g/1000 kcal of food intake appears beneficial. [9]
Many studies have also reported the unfavorable effects of smoking for diabetes mellitus. Smoking increases the risk of developing diabetes, and aggravates the micro- and macro-vascular complications of diabetes mellitus. [10] Chronic use of alcohol is considered to be a potential risk factor for the incidence of type 2 diabetes mellitus (T2DM), which causes insulin resistance and pancreatic β-cell dysfunction that is a prerequisite for the development of diabetes. [11]
Sleep disorders are significantly more common in persons with diabetes as compared to those without diabetes. Multiple factors may contribute to insomnia in persons with diabetes including discomfort or pain associated with peripheral neuropathy, restless legs syndrome, periodic limb movements, nocturia, associated depression and rapid changes in blood glucose levels during night leading to hypoglycemic and hyperglycemic episodes. [12] On the other hand, shorter sleep duration and erratic sleep behavior itself have been linked with higher incidence of obesity, metabolic syndrome, and T2DM. [13] Epidemiological data have suggested that higher risk of obesity and type 2 diabetes are commonly found in individuals with shorter sleep duration (<5–6 h/night) with poor sleep quality. [14]

Methodology
Cross sectional study was carried out with 100 Type 2 Diabetes patients in Mumbai City. The participants were selected by purposive sampling technique from diabetes health camps. Sample population included both genders with type 2 diabetes in the age group of 30 to 60 years. The study was divided into two groups on the basis of duration of diabetes. First group were who had diabetes for ≤5 years and second group were who had diabetes for ≥6 years. A questionnaire was administered to gather relevant data on general information, anthropometric measurements, biochemical parameters, clinical symptoms, medical history, personal habits, sleeping patterns, physical activity, physiological health, eating patterns, three day dietary recall and food frequency.
Statistical Methods
Analyses were performed using SPSS software for Windows (version 25, 2017, IBM Corporation, Armonk, New York, United State). Data are presented as Mean ± SD or percentage. The frequency distributions were tabulated for various parameters according to duration of diabetes and were compared using cross tabulations and chi-square test. Independent Sample T test was used to analyses the difference in various parameters when classified according to gender/ duration of diabetes. Pearson's correlation test was used to determine the correlation between anthropometry, blood parameters, blood pressure and nutrient intake. Kendall Tau's B. $p < 0.05$ was considered to be statistically significant.

Results and Discussion
Data on 100 type 2 diabetes (74 males and 26 females) with the mean age of 52.1± 8.8 years is presented in the current study.

Anthropometric Parameters: The mean height of the diabetes patients was 160.1± 6.1 cm and weight was 64.4± 12.9 Kg. Table 1 gives anthropometric characteristics of study population when classified according to gender and duration of diabetes. There was no significant difference in anthropometric measurements who had diabetes for ≤ 5 Years and who had diabetes for ≥ 6 years in both gender (P>0.05) (Table 1). When compared between gender, males were significantly taller as compared to females (P<0.05) (Table 1). Males who had diabetes for ≥ 6 years had significantly higher weight as compared to females who had diabetes for ≥ 6 years.
(P<0.05) (Table 1).

Table 1: Anthropometric parameters when classified according to gender and duration of diabetes

	Males			Females		
	Diabetes for ≤5 years (n=36)	Diabetes for ≥ 6 years (n=38)	P value	Diabetes for ≤5 years	Diabetes for ≥ 6 years	P value
Height (cm)	163.1±5.8*	161.0±5.2*	0.096	154.8±4.5	154.0±2.9	0.573
Weight (kg)	64.9±12.3	67.3±14.7*	0.447	59.6±10.7	59.3±8.8	0.937
BMI (kg/m2)	24.3±4	25.4±6.9	0.391	24.8±4.2	24.9±3.2	0.943
Waist circumference	100.2±18.9	105.6±19.5	0.227	98.2±18.5	107.8±16.7	0.180
Hip circumference	104.4±11.1	107.2±12.5	0.315	104.9±12.2	108.9±11.6	0.401
Waist to hip ratio	0.95±0.12	0.97±0.09	0.279	0.93±0.07	0.99±0.11	0.101

Data presented as Mean±SD. *p <0.05 for comparison between males and females

Medical History: There was no significance difference in prevalence of other clinical signs and symptoms when classified according to duration of diabetes (P>0.05). Prevalence of cataract percentage was significantly higher who had diabetes ≥ 6 years as compared to those who had diabetes for ≤ 5 Years (P<0.05).

Sleeping Habits: Study has been suggested that prolonged short sleep duration is associated with diabetes. [15] Most participants slept for 4 to 6 hours or 6 to 8 hours. There was a significant association of total hours slept and duration of diabetes with higher

percentage of participants who had diabetes for ≥ 6 years sleeping for 4 to 6 hours as compared to participants who had diabetes for ≤5 years (p<0.05) (Table 2).

Table 2: Total hours slept by participants

	Total (n=100)	Diabetes for ≤5 years (n=49)	Diabetes for ≥ 6 years (n=51)	χ2 value	P value
<4 hours	4 (4)	1 (2)	3 (5.9)	10.120	0.018*
4 to 6 hours	47 (47)	18 (36.7)	29 (56.9)		
6 to 8 hours	43 (43)	24 (49)	19 (37.3)		
8 hours	6 (6)	6 (12.2)	0 (0)		

Data presented as frequency (%) *Statistical difference at P<0.05

Physical Activity:

Physical activity and exercise should be recommended and prescribed to all individual with diet as part of management of glycemic control and overall health. [16] Significantly higher percentage of participants who had diabetes for ≤5 years did exercise as compared to participants who had diabetes for ≥ 6 years (p<0.05). There was an association of number of days exercised and duration of diabetes with higher percentage of participants who had diabetes for ≤5 years doing exercise daily as compared to those who had diabetes for ≥ 6 years (p<0.05) (Table 3). A significant association of daily physical activity level was found with duration of diabetes with higher percentage of participants who had diabetes for ≤5 years reported that their day was active as compared to participants who had diabetes for ≥ 6 years (p<0.05) (Table 3). Similarly, a significant association of duration of physical activity was found with duration of diabetes with higher percentage of participants who had diabetes for ≤5 years doing exercise for >45 minutes as compared to participants who had diabetes for ≥ 6 years (p<0.05) (Table 3).

Table 3: Physical activity status of participants

	Total (n=100)	Diabetes for ≤5 years (n=49)	Diabetes for ≥ 6 years (n=51)	χ2 value	P value
Exercise	35 (35)	26 (53.1)	9 (17.6)	13.776	0.001*
Number of days exercised					
No exercise	65 (65)	23 (46.9)	42 (82.4)	17.050	0.002*
2 to 3 days/week	1 (1)	1 (2)	0 (0)		
3 to 4 days/ week	17 (17)	10 (20.4)	7 (13.7)		
4 to 5 days/ week	1 (1)	1 (2)	0 (0)		
>5 days/ week	16 (16)	14 (28.6)	2 (3.9)		
Daily physical activity level					
Active	42 (42)	13 (26.5)	29 (56.9)	19.323	0.001*
Somewhat active	41 (41)	20 (40.8)	21 (41.2)		
Moderate active	17 (17)	16 (32.7)	1 (2)		
Duration of physical activity					
No exercise	65 (65)	23 (46.9)	42 (82.4)	15.758	0.003*
20 -30 minutes/day	15 (15)	10 (20.4)	5 (9.8)		
30-45 minutes/day	14 (14)	10 (20.4)	4 (7.8)		
45 minutes – 1 hour/day	5 (5)	5 (10.2)	0 (0)		
>1 hour/day	1 (1)	1 (2)	0 (0)		

Data presented as frequency (%) *Statistical difference at P<0.05

Frequency Consumption of selected Food Groups

Intake of cereals:

Out of the 100 participants, 91% consumed wheat flour, 37% consumed ragi flour, 57% consumed jowar flour, 18% consumed multigrain flour and 33% consumed rice. There was a significant association of duration of diabetes and consumption of diabetes with higher percentage of participants suffering from diabetes for ≥ 6 years not consuming wheat flour as compared to participants who suffered from diabetes for ≤5 years (p<0.05) (Table 4).

Intake of milk and milk products: A significant association of duration of diabetes and consumption of milk was found with higher percentage of participants suffering from for ≥ 6 years consuming milk for >4 days/ week as compared to participants who suffered from diabetes for ≤5 years (p<0.05) (Table 4).

Frequency intake of fruits:

Study has been suggested in Chinese adults that higher consumption of fresh fruits was significantly associated with lower risk of diabetes. [18] Out of the 100 participants, 35% consumed mangoes, 25% consumed grapes, 52% consumed apples, 12%

consumed bananas, 8% consumed chiku, 26% consumed pears and 59% consumed oranges. There was a significant association of duration of diabetes with consumption of apple, pear and oranges with higher percentage of participants suffering from diabetes for ≥ 6 years not consuming apple, pear and orange as compared to participants who suffered from diabetes for ≤5 years ($p<0.05$) (Table 4.)

Frequency intake of fast foods:

Out of the 100 participants, 29% consumed pizza, 58% consumed cakes and pastry, 90% consumed vadapav, 31% consumed frankie, 51% consumed Chinese and 89% consumed fried foods. There was significant association of duration of diabetes with consumption of pizza, cakes and pastry, frankie and Chinese with higher percentage of participants suffering from diabetes for ≥ 6 years not consuming these foods as compared to participants who suffered from diabetes for ≤5 years ($p<0.05$) (Table 4).

Frequency intake of Sugar:

Out of the 100 participants, 34% consumed sugar, 47% consumed sweets and 16% consumed artificial sweeteners. When classified according to duration of diabetes there was significant association of duration of diabetes with consumption of sugar with higher percentage of participants suffering from diabetes for ≥ 6 years not consuming sugar as compared to participants who suffered from diabetes for ≤5 years ($p<0.05$) (Table 4).

Table 4: Frequency intake of selected food groups when classified according to duration of diabetes

	Diabetes for ≤5 years (n=49)						Diabetes for ≥ 6 years (n=51)						$\chi 2$ value	P value
	None	Fortnight	Once/ week	2-3 times/ week	4 to 5 times/ week	Daily	None	Fortnight	Once/ week	2-3 times/ week	4 to 5 times/ week	Daily		
Wheat flour	1 (2)	0 (0)	9 (18.4)	12 (24.5)	7 (14.3)	20 (40.8)	8 (15.7)	3 (5.9)	4 (7.8)	6 (11.8)	13 (25.5)	17 (33.3)	14.377	0.013*
Milk	30 (61.2)	2 (4.1)	0(0)	2 (4.1)	5 (10.2)	10 (20.4)	26 (51)	0 (0)	2 (3.9)	0 (0)	15 (29.4)	8(15.7)	11.473	0.043*
Apple	19 (38.8)	8 (16.3)	13 (26.5)	9 (18.4)	0 (0)	0 (0)	29 (56.9)	12 (23.5)	8 (15.7)	2 (3.9)	0 (0)	0 (0)	8.492	0.037*
Pear	29 (59.2)	11 (22.4)	7 (14.3)	2 (4.1)	0 (0)	0 (0)	43 (84.3)	2 (3.9)	5 (9.8)	1 (2)	0 (0)	0 (0)	9.583	0.022*
Orange	16 (32.7)	3 (6.1)	12 (24.5)	16 (32.7)	2 (4.1)	0 (0)	25 (49)	6 (11.8)	10 (19.6)	3 (5.9)	5 (9.8)	2 (3.9)	15.304	0.009*
Pizza	28 (57.1)	11 (22.4)	10 (20.4)	0 (0)	0 (0)	0 (0)	43 (84.3)	7 (13.7)	1 (2)	0 (0)	0 (0)	0 (0)	11.386	0.003*
Cake and pastry	15 (30.6)	25 (51)	9 (18.4)	0 (0)	0 (0)	0 (0)	27 (52.9)	21 (41.2)	3 (5.9)	0 (0)	0 (0)	0 (0)	6.739	0.034*
Frankie	27 (55.1)	11 (22.4)	8 (16.3)	3 (6.1)	0 (0)	0 (0)	42 (82.4)	4 (7.8)	4 (7.8)	1 (2)	0 (0)	0 (0)	8.824	0.032*
Chinese	17 (34.7)	13 (26.5)	14 (28.6)	4 (8.2)	1 (2)	0 (0)	32 (62.7)	12 (23.5)	4 (7.8)	2 (3.9)	1 (2)	0 (0)	10.818	0.029*
Sugar	24 (49)	0 (0)	0 (0)	0 (0)	0 (0)	25 (51)	42 (82.4)	0 (0)	0 (0)	0 (0)	0 (0)	9 (17.6)	12.403	0.001*

Data Presented as frequency (%) *Statistical difference at P<0.05

Nutrient intake: The mean energy intake was 1193±236 kcal/day, protein intake was 36.8±9.2 g/d, carbohydrates was 154.2±38.1 g/d, fats was 44.5±9.1 g/d, fibre was 24.9±8.2 g/d, total starch was 118.2±32.8 g/d, fructose was 5.7±4.4 g/d, glucose was 2.8±2.2 g/d, sucrose was 3.2±2.7 g/d and free sugar was 16.5±8.2 g/d. **Table 5** gives nutrient intake of participants when classified according to gender and duration of diabetes. Males who had diabetes for ≤5 years had significantly higher sucrose intake as compared to males who had diabetes for ≥ 6 years ($p<0.05$) (**Table 5**). When compared between gender, males who had diabetes for ≥ 6 years had significantly higher carbohydrate and fibre intake as compared to females who had diabetes for ≥ 6 years ($p<0.05$) (**Table 5**). No other significant difference were observed in nutrient intake ($p>0.05$) (**Table 5**).

Table 5: Nutrient and RDA intake of participants when classified according to gender and duration of diabetes

	Males			Females		
	Diabetes for ≤5 years (n=36)	Diabetes for ≥ 6 years (n=38)	P value	Diabetes for ≤5 years	Diabetes for ≥ 6 years	P value
Energy (kcal/d)	1214±273	1221±224	0.904	1151±222	1092±152	0.437
Proteins (g/d)	36.6±10	38±8.1	0.503	37.5±11.5	33.6±7.2	0.314
Carbohydrates (g/d)	158.6±41.8	159.9 ±38.1*	0.884	145±32.8	134.5±26.3	0.337
Fats (g/d)	44.2±8.3	44.8±9.9	0.808	43.5±10.4	45.4±8.9	0.621
Fibre (g/d)	26.5±10.4	25.6±6.1*	0.632	23.1±6.9	20±6.1	0.239
Total starch (g/d)	122.8±41.2	120.6±28.5	0.793	111.4±23.1	105.8±25.6	0.562
Fructose (g/d)	6.6±4.6	5.3±4.4	0.213	6.4±3.3	4±3.1	0.155
Glucose (g/d)	2.7±1.8	2.8±2	0.789	4.0±3.1	2±0.7	0.098
Sucrose (g/d)	4.1±2.8 *	2.6±1.7	0.032	3.3±2.6	2.1±1.6	0.170
Free sugar (g/d)	17.7±8.3	15.5±7.7	0.24	19.1±8.2	13.5±8.5	0.099
RDA energy (%)	52.3±11.8*	52.6±9.6	0.904	60.6±11.7	57.5±8	0.437

Data presented as Mean±SD. *p <0.05 for comparison between males and females

Correlations of Anthropometry and BP with blood parameters:

Table 6 gives correlation of BMI, hip circumference, waist circumference, systolic BP and diastolic BP with blood parameters. BMI, hip circumference and waist circumference were significantly positively correlated with total cholesterol and triglycerides ($p<0.05$) (**Table 6**). BMI was significantly negatively correlated with random blood sugar, fasting blood sugar, post prandial blood sugar and HbA1c ($p<0.05$) (**Table 6**). Random blood sugar was also significantly negatively correlated with hip circumference ($p<0.05$) (**Table 6**). Blood urea and serum creatinine were significantly positively correlated with systolic and diastolic BP ($p<0.05$) (**Table6**).

Table 6: Correlation of BMI, hip circumference, waist circumference, systolic BP and diastolic BP with blood parameters:

	BMI	Hip circumference	Waist circumference	Systolic BP	Diastolic BP
Total cholesterol	0.467*	0.395*	0.223*	0.011	0.050
Triglyceride	0.393*	0.297*	0.331*	0.127	0.049
Random blood sugar	-0.331*	-0.343*	-0.097	0.098	0.047
Fasting blood sugar	-0.200*	-0.153	-0.088	-0.036	-0.022
Post prandial sugar	-0.221*	-0.194	-0.047	0.006	0.047
HbA1c	-0.259*	-0.244	-0.159	0.080	0.090
Blood urea	-0.047	-0.040	0.260*	0.235*	0.218*
Serum creatinine	0.025	-0.063	0.019	0.227*	0.273*

Data presented as Pearson's Correlation R value. * p<0.05

Conclusion

Daily physical activity, adequate sleep helps to manage the duration of diabetes. Subjects with increased BMI, hip and Waist circumference are also at risk for developing hypercholesterolemia and hypertriglyceridemia in type 2 diabetes patients. Thus it implies, a healthier lifestyle and dietary restrain in diabetic patients is recommended at large.

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